

ES10024 () Alternator Continued Airworthiness (ICA) & Brush Service Instructions

INTRODUCTION:

The Kelly Aerospace Energy Systems, LLC (KAES) alternator model ES10024 () is of a new design coming into the general aviation market and it's applications, though numerous, are not extensive. The newly produced overhaul and maintenance manual is not yet available to qualified repair stations and mechanics. Therefore, KAES is issuing this SIL to provide basic continued airworthiness instruction (ICA) for the ES10024 () alternator when used in specific certified engines or aircraft. Basic continued airworthiness consists of required periodic inspections, general troubleshooting, and brush inspection and/or replacement instruction. At this time, any condition beyond the scope of this publication requires overhaul of the alternator.

This Service Information Letter provides Instruction for Continued Airworthiness consisting of periodic inspection requirements, general troubleshooting, and instruction for removing, inspecting, and if necessary replacing the brush assembly in ES10024-() alternator.

COMPLIANCE:

At each annual inspection not to exceed the applicable time in service requirement of periodic inspection Chart 1 on page 5. - **and/or** - Any time it is necessary to inspect or replace the alternator brushes on a model ES10024 () alternator.

EFFECTIVITY:

All Kelly Aerospace Energy Systems model ES10024 () alternators when used in Type Certificated aircraft or engines. *(Currently limited to Teledyne Continental Motors series IO-550 and IOF-550 engines. Includes, but is not limited to Beechcraft (Raytheon), Cessna, Cirrus, Columbia, and Lancair airplane applications.)*

PROCEDURE:

Inspection: *(Chart 1 on page 5)*

WARNING:

The alternator when mounted on an aircraft, presents a physical hazard from propellers and rotating devices. The alternator produces a high electrical current output which presents an electrical shock hazard, that can result in serious injury if proper safety procedures are not followed.

Caution:

It is required to reference the aircraft AFM or POH as well as the applicable service or maintenance manual as required when servicing this alternator. Failure to do so may result in damage to the aircraft and equipment.

1. Determine if your airplane uses a ES10024-() alternator. This may be done by observing the equipment list, logbook, or other airframe or engine paperwork. If still undetermined, it will be necessary to remove the cowling and observe the body of the alternator for the data tag.

For questions concerning this instruction please contact KAES, Service Dept. at (888) 461-6077. Contact your local KAES distributor to purchase available service parts.

PROCEDURE: (cont'd)

Inspection: (Chart 1)

2. If an ES10024-() alternator is installed, the Periodic Inspections of Chart 1 found on page 5 apply.
3. Check the time in service on the unit and begin inspections at the nearest time interval and task. For example, if the unit is new or recently overhauled, start at the ten (10) hour inspection. If the unit was installed prior to release of this SIL and has 100 hours start at this inspection and so on. *If the time is unknown it is best to start with the 500 hour inspection to properly examine the brushes and other working components.*
4. If the alternator is not an ES10024-(), proceed to Return to Service instruction 15 on page 3. *If another alternator, check the KAES website to see if a similar SIL exists for the alternator model you have.*
5. For each inspection on Chart 1 requiring torque application, refer to Table 1 on page 3.

Troubleshooting: (Chart 2 on page 6)

6. Troubleshooting may help to determine the root cause and avoid unnecessary replacement of the alternator. If there are conditions beyond those in the periodic inspection chart, refer to Chart 2 General Troubleshooting on page 6 before attempting any repair, overhaul, or replacement the alternator.
7. Chart 2 lists the five areas of trouble common to this alternator. Choose the applicable symptom you are experiencing and follow the trouble shooting advice beneath as applicable. For example, your symptom is low or no alternator output. The possible cause would be *loose terminal connections or worn or broken brushes*. After each cause a remedy is suggested.
8. The remedies suggested may require work on the alternator or work on the aircraft or engine. Remember, if corrective action on the alternator is beyond tightening hardware or replacing the brush holder assembly, the alternator must be returned for overhaul. In addition, if aircraft or engine work is required, reference to the applicable service or maintenance manual will be required.

Brush inspection and/or replacement:

9. Upon achieving each 500 hours time in service or any time the alternator brushes need to be inspected or brush holder assembly replaced, the following instructions apply. *(Depending upon the reason for inspection or replacement, brush holder removal and installation may be done with alternator on or off the aircraft engine.)*
10. Refer to Figure 1 & 2 to locate and remove the brush holder assembly. *(See material required section on page 4 for brush holder assembly and hardware part numbers.)*

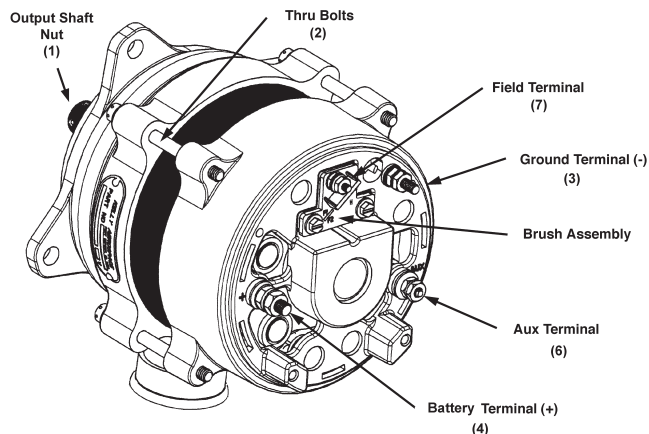


Figure 1 Brush Holder Location

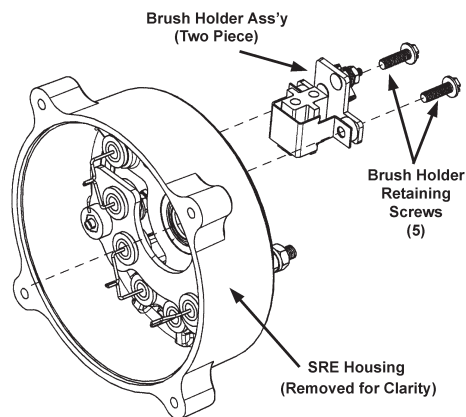


Figure 2 Remove Screws

11. Disconnect the F1 (field) wire by removing hardware. Remove the two screws retaining the brush holder assembly to the slip ring end housing. Carefully remove the brush holder assembly so that the brushes do not fall into the alternator or fall out and chip or break.

PROCEDURE: (cont'd)

Brush inspection and/or replacement:

12. Remove brushes from holder and mark on side to indicate removed position. Inspect brushes for chipping or other damage including spring, cap, or wire. If damage appears to spring or there are broken strands in brush lead, discard brush. If no damage is apparent, measure the length of the black brush block. New brushes measure .5 inch (1.27 cm). To reuse the brush it must be a minimum 50% of new or .25 inch (.635 cm). If less than this figure, replace brush holder with two new brushes. *(Never replace a single brush, replace as a set only!)*
13. If it is determined that the brushes are reusable, inspect the brush holder for cracks or other damage. Never reuse a damaged brush holder even if the brushes are good. Place each brush into the brush holder in the same position and orientation as removed. Install a two inch stiff 22 gage insulated wire into the hole provided in side of the brush holder while pushing in each brush with a soft tool like a small wood or plastic dowel. The wire will retain the brushes for installation of the holder. *(New brushes shipped with retaining wire installed.)*
14. Install a new or the reused brush holder assembly and two retaining screws. Torque screws to 25 to 35 in-lbs. Spin rotor and check for interference between the brush holder and rotor. Remove the brush retaining wire allowing the brushes to snap into place. Measure the resistance between the field and ground terminals (ES10024-1) or F1 and F2 (ES10024B) with an ohmmeter while rotating the shaft. The ohmmeter must indicate a rotor resistance of between 7 and 20 ohms. To complete brush replacement or inspection task, re-attach F1 (field) wire and torque per Table 1 below.

Torquing Hardware:

15. When hardware is replaced (nuts, screws, etc.) be sure to use an appropriate torque tool properly calibrated for the task. Follow the torque settings recommended on Table 1 below for all hardware that is part the alternator. Hardware which retains aircraft terminals or the output shaft nut must be torqued to the specification called out by the engine or airframe manufacturer in their service instructions or manuals. *(Table 1 data may be used if OE data cannot be found or original data is no longer available.)* When checking for loose alternator hardware or when replacing terminal wires on their respective studs, the following should be observed:

All nut torque applied from Table 1 are for the first (bottom) nut on each stud of the alternator.

When checking field, ground, aux, and battery terminal nuts for looseness, make sure that the bottom nut be held in place with a thin wrench to secure nut, then apply the recommended torque to the top nut. *(Torquing the top nut without holding the bottom may allow the bottom nut to be over torqued.) Permanent damage will occur to the alternator if nuts are over torqued!*

Great care must be taken with the field terminal as the bottom nut torque is very low. It is very easy to over torque the top nut when attaching the field wire. *Over torque will destroy the brush holder.*

Remove safety wire to check thru bolt torque. Observe that the thru bolt has threads visible both above and below the mounting ears to prevent a false torque should the bolt bottom out. Check torque at 180° to each bolt. With torque correct, properly reinstall safety wire.

When using aftermarket gear P/N 646655R, use output shaft torque in Table 1. When using TCM gear, P/N 646655 refer to TCM service documentation for installation and torque.

Table 1

Description	Torque Value (US)	Torque Value (SI)
(1) Output Shaft Nut	37-42 ft/lbs	50.17-56.94 Nm
(2) Thru Bolts	40-45 in/lbs	5.08-5.65 Nm
(3) Ground Nut*	25-30 in/lbs	2.82-3.39 Nm
(4) Battery Nut*	70-85 in/lbs	7.91-9.60 Nm
(5) Brush Holder Screws	25-35 in/lbs	2.82-3.95 Nm
(6) Aux Nut*	25-30 in/lbs	2.82-3.39 Nm
(7) Field Nut*	6-8 in/lbs	.68-.90 Nm

* Attachment of Ground, Battery, Aux. or Field wires from the engine or airframe will require proper torque from the applicable engine or aircraft service or maintenance manual. *Bottom nut must be held in place to achieve proper engine or airframe torque.*

RETURN TO SERVICE:

16. Utilizing the applicable aircraft and engine manufacturers maintenance manuals, install any portion of the aircraft removed to gain access.
17. Upon successful completion of this service information letter by completion of inspections per the periodic requirement of Chart 1, and/or replacement of the alternator brush holder assembly, make an appropriate log book entry of compliance.

MATERIAL REQUIRED:

As required, one (1) each Brush Holder assembly, part number ALE-3045BS for ES10024-1 or part number ALU-3045BS for ES10024B and two (2) each Screw, part number 03C44209B15. *(New Brush holder assembly includes brushes.)*

If desired, the following parts are available:

Nut, output shaft, P/N 8X-4075; "O" ring, shaft external, P/N 32B70247A01;
Thru bolt, P/N 40426; Lock washer, thru bolt, P/N 12X-3074;
Nut, Output terminal, P/N 8X-1063; Output terminal, Lockwasher, P/N 12X-0199;
Nut, cupped, Ground terminal, P/N 40298;
Nut, Aux terminal, P/N 8X-0173; Aux terminal, Lockwasher, P/N 12X-0196.
Gear, clutch ass'y TCM: P/N 646655
KAES: P/N 646655R

PARTS AVAILABILITY:

Parts to support this service bulletin must be obtained from an authorized Kelly Aerospace Energy Systems Distributor of your choice. *Any supplementary part which may be required such as the TCM gear clutch assembly, cooling ducts, etc. must be obtained from the engine or airframe manufacturer as applicable.*

WARRANTY STATEMENT:

The sole warranty for the actions within this service bulletin are contained in the KAES Limited Warranty Policy issued with the purchase of each new alternator (see terms and conditions therein). Issuance of this service bulletin in no way constitutes an implied or expressed warranty of any kind.

Other warranty may apply per the terms and conditions in the aircraft or engine manufacturers Limited Warranty Policy, contact the appropriate party to enquire.

This publication does not imply or state any responsibility for the workmanship of any person or entity performing work or maintenance on the alternator or electrical system.

CONTACT INFORMATION:

If you have any questions concerning this service information letter, please contact Kelly Aerospace Energy Systems Technical Support at 888-461-6077. Or write at:

Kelly Aerospace Product Support
2900 Selma Highway
Montgomery, AL 36108, USA
Website: www.kellyaerospace.com

For e-mail, go to the Kelly Aerospace website, <http://www.kellyaerospace.com>, and select CONTACT, then follow instructions.

Questions concerning the aircraft or engine service or operation must be forwarded to the applicable manufacturer of that product.

Chart 1

PERIODIC INSPECTION ES10024-() ALTERNATOR

General

This form calls out the various checks and inspections needed to assure reliable and safe operation of the alternator while in service (instruction for continued airworthiness). They are listed in hours time in service (TIS) or in calendar time whichever is applicable. Some checks and inspections are one time initial and others are recurring. This periodic inspection applies to all new, rebuilt, or overhauled ES10024-() alternators produced by Kelly Aerospace Energy Systems, LLC. Refer to information contained in SIL A-135 (*latest Rev.*) for requirements for each specific inspection.

Inspection Checks

10 Hours (TIS). (one time)

Perform an initial check of the alternator assembly. Note through bolt security and proper safety wire application. Re-torque if bolts are found loose. Check alternator for general security. Check for signs of overheating or electrical arcing. Check the cooling duct connection and associated air inlet for security and cleanliness (*if installed*). Make sure the alternator assembly is clear of interference with any engine or airframe structure. Check the alternator to engine mounting bolts for proper torque per aircraft, rotorcraft and/or engine service instructions or maintenance manual. Check all terminal hardware for tightness and insulators for condition.

50 Hours (TIS). (one time)

Perform a check of the alternator assembly. Note through bolt security and proper safety wire application. Re-torque if bolts are found loose. Check the alternator to engine mounting bolts for proper torque per aircraft, rotorcraft and/or engine service instructions or maintenance manual. Check for signs of overheating or electrical arcing. Check all terminal hardware for tightness and insulators for condition.

100 Hours (TIS) and each 100 hours thereafter. (or each annual inspection, not to exceed 100 hours.)

Perform a check of the alternator assembly. Note through bolt security and proper safety wire application. Re-torque if bolts are found loose. Check the alternator to engine mounting bolts for proper torque per aircraft, rotorcraft and/or engine service instructions or maintenance manual. Inspect area around the brush holder for soot. If a large amount of soot appears, remove each brush and check for wear or damaged brushes. If severe wear has occurred, check slip rings for gouges or scratches. Check for oil leaks at cooling air outlet spout. Check all terminal hardware for tightness and insulators for condition.

500 Hours (TIS) and each 500 hours thereafter. (or each two years, not to exceed 500 hours.)

Remove each brush and check for wear or damaged brushes. If brush shows more than 50% wear, has chips or damage, or broken brush lead strands, replace brushes (brushes must be replaced as a set with the brush holder). If brushes are to be reused, return them in the position and orientation as removed, *as a set*. Remove alternator and check the engine to alternator gear clutch assembly (If installed) for slippage and condition of gear teeth per TCM's or other engine manufacturers service instructions or maintenance manual. Replace if required. Examine insulators for cracks or burns. Inspect the aluminum housings for condition and for surface corrosion, clean and treat if required. *The recurring 100 hour inspection is not inclusive and must be done in conjunction with this inspection.* Conditions found that require replacement parts other than the brush holder ass'y, drive gear, or hardware will require overhaul of the alternator.

2000 Hours (TIS). (or 12 years and at any engine overhaul)

Recommend overhaul or replacement of alternator assembly. *This a maximum time in service, actual overhaul time may vary based on cooling, electrical load, and conditions of use. The airframe or engine manufacturer recommended TBO, if less shall supercede this TBO.*

Chart 2

GENERAL TROUBLESHOOTING FOR ES10024-() ALTERNATOR

General troubleshooting consists of five areas of trouble in an alternator. Choose the applicable symptom you are experiencing and follow the trouble shooting advice as applicable. If corrective action on the alternator is beyond tightening hardware or replacing the brush holder assembly, the alternator must be sent for overhaul.

1. Symptom: Low or no output

Loose terminal connections: Inspect the terminals, if they will tighten, do so, if not the alternator may need to be disassembled to replace studs or receptacles. Also observe the wire terminal ends to assure they are crimped properly on the wire and no corrosion or burns are present.

Worn or broken brushes: Remove and examine brush material, spring, and leads. If spring is broken or the lead is coming out of brush, or if brush is chipped or worn past 50% replace brush holder assembly.

2. Symptom: Battery is discharged

Corroded or loose battery cable connectors: If connections to the battery are corroded, disconnect and clean. Clean battery posts or terminals. If aluminum cable is installed, make sure that corrosion has not spread under the insulation. If severe, replace cables and connectors. Tighten battery connections.

Defective battery or needs maintenance: Perform normal battery maintenance. Check water level and electrolyte condition, service per the aircraft service manual. Check for expected battery life, if near or beyond normal life, replace battery.

Accessory load too high for alternator rating: Refer to the AFM or POH (and aircraft service manual) for the maximum allowable load specification. Equipment installed beyond aircraft load capability, reduce electrical load to meet these limitations.

Drive clutch slipping: Inspect the condition of the drive gear clutch. (As installed) This part may be supplied by OE engine manufacturer or by after market suppliers. Improper tension supplied by this clutch will allow slippage during high alternator output.

Voltage regulator malfunction: Check the voltage regulator per the aircraft service manual and adjust if necessary. If adjustment is not possible, check wiring and replace voltage regulator.

3. Symptom: Battery is overcharged

Voltage regulator set too high for aircraft operating conditions: Check the voltage regulator setting per the aircraft service manual. Adjust if necessary. If adjustment is not possible, check the wiring harness before replacing the voltage regulator.

Ground wire loose or broken between regulator and alternator: If wire is broken, make sure there is adequate strain relief and clear chaffing areas. Repair or replace wire. If loose, tighten connection.

Shorted voltage regulator output - full field condition: Before replacing the voltage regulator, check wiring harness for shorts or open conditions. If harness is burnt or shows signs of overheating, replace harness. If, wiring is good replace voltage regulator.

4. Symptom: Noisy in operation (mechanical)

Foreign object in cooling duct: Check the duct and inlet to see if debris have entered the alternator and are rubbing or vibrating.

Loose mounting bolts: Inspect mount points for damage and if found overhaul the alternator. If not, re-torque mounting bolts per the engine or aircraft service manual.

Interference from airframe components or structure: Examine the alternator and large electrical cables for contact or chaffing on airframe structure. Check and clear any interference areas.

Defective bearing: To perform a test for faulty bearings, hold the alternator in one hand and snap-spin the /shaft with the other. A defective bearing will be heard or felt. Replace the bearing or overhaul the alternator.

Drive clutch slipping: Inspect the condition of the drive gear clutch. (As installed) This part is supplied by the engine manufacturer. Improper tension supplied by this clutch will allow slippage during high alternator output. Consult engine service instructions.

5. Symptom: Noisy in operation (electrical)

Shorted rectifier (magnetic noise): Place oscilloscope on main electrical bus. If AC is found on DC bus, overhaul the alternator.

Insufficient output filtering: Check the RFI filter by performing a capacitance check. Replace RFI filter if defective. In some cases, additional RFI filters may be installed, be sure that a check is performed on each.

Brush arcing: Remove and examine brush material, spring, and leads. If spring is broken or the lead is coming out of brush, or if brush is chipped or worn past 50% replace brush holder assembly.

Rough or damaged slip ring surface: If the slip rings show minor surface roughness they may be polished. If the slip rings are worn or damaged beyond limits, replace the rotor (requires overhaul of alternator).

Loose field or aux terminal connections: Check terminal connections for damage. Provide adequate strain relief to the wiring and tighten terminals properly.

Loose ground or battery connections: Check ground and battery connections for damage. Provide adequate strain relief to the cables and tighten properly. (See engine or aircraft service manuals.)

Resistive or arcing circuit breaker: Make a resistance check of the circuit breaker, essentially, there should be no resistance. Check breaker function. Old circuit breakers should be replaced.

Defective voltage regulator or connector: Check to see if the regulator connector is attached properly. Remove and examine connector. Look for arcing or overheating. Check wiring harness and replace the voltage regulator if defective.